IS 16074 : 2013

(Reaffirmed 2018)

भारतीय मानक

इस्पात के सपाट दरवाजे के शटर्स — विशिष्टि

Indian Standard

STEEL FLUSH DOOR SHUTTERS — SPECIFICATION

ICS 91.060.50

© BIS 2013

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2013 **Price Group 7**

Doors, Windows and Shutters Sectional Committee, CED 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Doors, Windows and Shutters Sectional Committee had been approved by the Civil Engineering Division Council.

With limited availability of good quality timber, door shutters traditionally manufactured from timber or wood are increasingly being replaced with shutters manufactured with other materials. Flush door shutters manufactured from steel is one such alternative and are now widely in use. Steel flush door shutters have a reinforced inner core constituted of materials like mineral wool or polyurethane foam or kraft paper or steel stiffeners with an outer skin of steel sheet and are used in indoor and outdoor applications in both residential and industrial buildings. In order to provide guidance on the quality of the product and its performance requirements, a need was felt to formulate a standard on steel flush door shutters.

Notwithstanding the advantages of modular coordination, it has been noticed that there is sufficient demand for door shutter of sizes other than modular sizes. In view of the above, the standard permits non-modular sizes in addition to the modular sizes. Non-modular sizes particularly required in maintenance/replacement works of existing door shutters.

In the formulation of this standard, due weightage has been given to standards and practices prevailing in the country.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard, is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STEEL FLUSH DOOR SHUTTERS — SPECIFICATION

1 SCOPE

This standard lays down the requirements regarding types, sizes, materials, construction, workmanship, finish and tests of steel flush door shutters for internal and external use in residential and industrial buildings.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 10428 shall apply (*see also* Fig. 1).

4 HANDING

Handing and direction of closing of doors shall be designated in accordance with IS 4043.

5 CLASSIFICATION

The door shutters shall be classified based on the thickness of door skins as 'Heavy Duty' and 'Light Duty' shutters.

6 MATERIAL

6.1 Door Skins

The outer door skins shall be manufactured from materials conforming to relevant Indian Standards are as given in Table 1.

6.1.1 In the case of heavy duty door shutters, the door skins may be manufactured from steel sheet of higher thickness of 1 mm or 1.25 mm, as agreed to between the purchaser and the manufacturer.

6.2 Rigid Polyurethane Foam

Rigid polyurethane foam used shall be of minimum density of 40 kg/m^3 containing polyol and isocynate in the ratio of 1:1.20.

7 DIMENSIONS, SIZES AND TOLERANCES

7.1 Sizes

Steel flush door shutters shall generally conform to the modular sizes specified in Table 2 (*see also* Fig. 1). Sizes other than modular sizes as agreed to between the manufacturer and the purchaser may also be permitted.

7.2 The nominal thickness of the shutters shall be 25 mm, 30 mm and 35 mm corresponding to each of the sizes as indicated in Table 3.

However, for sizes greater than 12 DT 21, the thickness of such shutter shall be greater than 35 mm and shall be as agreed to between the manufacturer and the purchaser.

For sizes other than modular sizes, the thickness of the shutters shall be any of those specified in Table 3 but shall not be less than that specified for the nearest higher modular size of shutter given in Table 3.

7.3 Tolerances

The following tolerances on size of door shutters shall apply:

Dimension	*Tolerance*
Width	$^{+0}_{-2}$ mm
Height	$^{+0}_{-4}$ mm
Thickness	± 1.5 mm

8 CONSTRUCTION AND WORKMANSHIP

8.1 Construction

Door shutter shall consist of two outer door skins of steel sheets with lock seam joint on one vertical side edge and 'C' channel shape on other side. The door skins shall be assembled together at lock seam joint at vertical edge of door shutter by any one alternative as shown in Fig. 2. The top and bottom sides of door shutter shall be made of any one alternative as shown in Fig 3. A pressed 'C' channel of steel strips having minimum thickness of 1.6 mm shall be provided on both hinge and lock inner sides to fix necessary stiffeners for the hinges and other hardware fittings (*see* Fig. 4).

Table 1 Requirements for Material of Door Skin
(*Clause* 6.1)

All dimensions in millimetres.

Sl No. (1)	Material (2)	Nominal Thickness Light Duty (3)	 Heavy Duty (4)	Ref to IS No. with Grade/ Designation (5)
i)	Mild steel sheet	0.63	0.80	Designation CR2/ Grade D of IS 513
ii)	Galvanized steel sheets	0.63	0.80	Plain, type lock forming/designation GPL of IS 277 with grade of zinc coating of 120
iii)	Stainless steel	0.50	0.60	Grades X07Cr17 or X04Cr19Ni9 of IS 6911
iv)	Pre-painted steel sheets	0.63	0.80	IS 14246

Table 2 Dimensions of Steel Door Shutters
(*Clause* 7.1)

All dimensions in millimetres.

Sl No. (1)	Designation of Doors (2)	Width (3)	Height (4)
i)	8 DS 20	700	1 905 (1 945)
ii)	8 DS 21	700	2 005 (2 045)
iii)	9 DS 20	800	1 905 (1 945)
iv)	9 DS 21	800	2 005 (2 045)
v)	10 DS 20	900	1 905 (1 945)
vi)	10 DS 21	900	2 005 (2 045)
vii)	12 DT 20	1 100[1]	1 905 (1 945)
viii)	12 DT 21	1 100[1]	2 005 (2 045)

NOTES

1 D = Door, S = Single leaf shutter and T = Double leaf shutter.

2 The designation refers to modular size of door opening. First number stands for width in modules of 100 mm and the last for height in modules of 100 mm.

3 Standard sizes of door frames are covered in IS 4021 and IS 4351.

4 The standard widths and heights for steel flush door shutters are arrived at as shown in Fig. 1. In case the modular height is taken from the finish floor level the height of the door shall be the one given in bracket. In the case of double leaf shutter, the rebate in the shutter shall be as given in **8.4**.

---

[1] Combined width of double leaf shutters.

Table 3 Thickness of Door Shutters
(*Clause* 7.2)

All dimensions in millimetres.

Sl No. (1)	Designation of Doors (2)	Flush Door Designation (3)	Thickness of Shutter (4)
i)	8 DS 20	8 DS 20 and 8 DS 21	25
ii)	9 DS 21	9 DS 20 and 9 DS 21	30
iii)	10 DS 20	10 DS 20 and 10 DS 21	35
iv)	12 DS 21	12 DS 20 and 12 DS 21	35

8.2 Core

The core or the inner hollow portion shall be filled with any one of the following alternatives (*see* Fig. 5):

a) *Rigid Polyurethane Foam Core* — The inner hollow portion shall be filled or injected with rigid polyurethane foam (PUF) of minimum density 40 kg/m^3 after pretreatment and powder coating. Painting may be done after PUF filling or injection.

b) *Honey Comb Kraft Paper Core* — Honey comb kraft paper of suitable size shall be used to fill the inner hollow portion of the door shutter and shall be constructed using adhesive for permanent pressure bond with the door skin.

c) *Mineral Wool/Rock Wool Core/Polystyrene Core* — Mineral wool or rock wool of suitable grade as agreed to between the purchaser and the manufacturer shall be used as a core material. Polystyrene sheet of suitable size can be chemically bonded to the inner surface of the door shutter as core material providing total surface support.

d) *Hollow Steel Stiffened Core* — The hollow portion of the door shutter shall be stiffened by using steel hat section of suitable size made from steel sheet of minimum thickness of 0.8 mm.

8.3 Opening for Glazing

When required by the purchaser, opening for glazing shall be provided and unless otherwise specified, the opening provided shall be 250 mm in height and 150 mm or 200 mm in width. Unless otherwise specified by the purchaser, the bottom of the opening shall be at a height of 1 400 mm from that of the bottom edge of the shutter (*see* Fig. 6). The opening for glazing shall be lipped internally with pressed 'C' channel of steel sheet of minimum 1.25 mm thickness.

8.4 Venetian

When required by the purchaser, a venetian opening shall be provided and unless otherwise specified the height of the opening shall be 350 mm minimum. The width of the opening shall be as specified by the purchaser but shall provide for a clear space of at least 125 mm between the edges of the door and the venetian opening.

8.5 Rebating

In case of double leaved shutters, at the meeting of stiles, an overlap projection of folded steel strip of 35 mm width shall be provided (*see* Fig. 7). Alternatively, a 30 mm wide and 1 mm thick folded and pressed steel strip shall be welded or screwed to each shutter leaf (*see* Fig. 7).

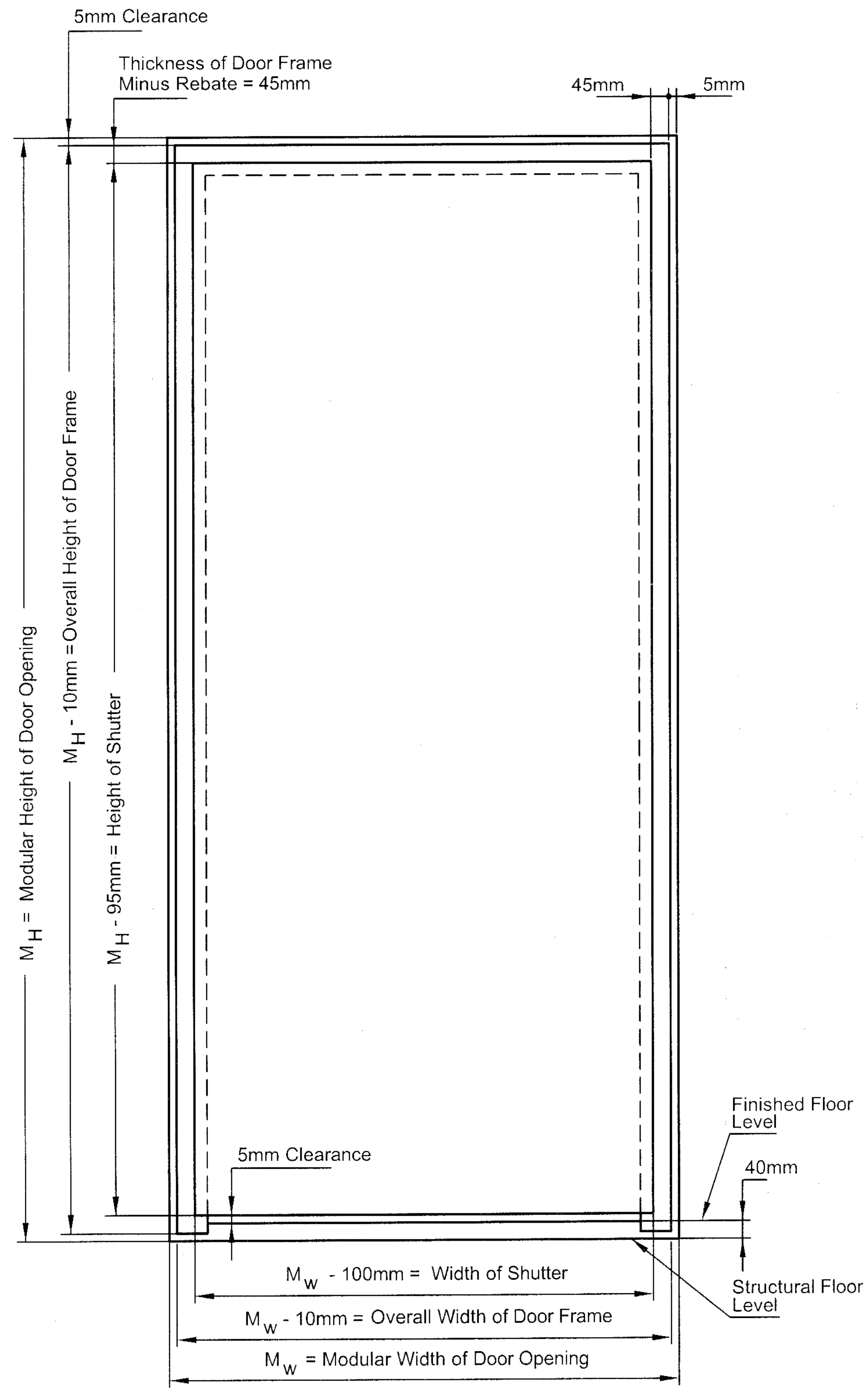
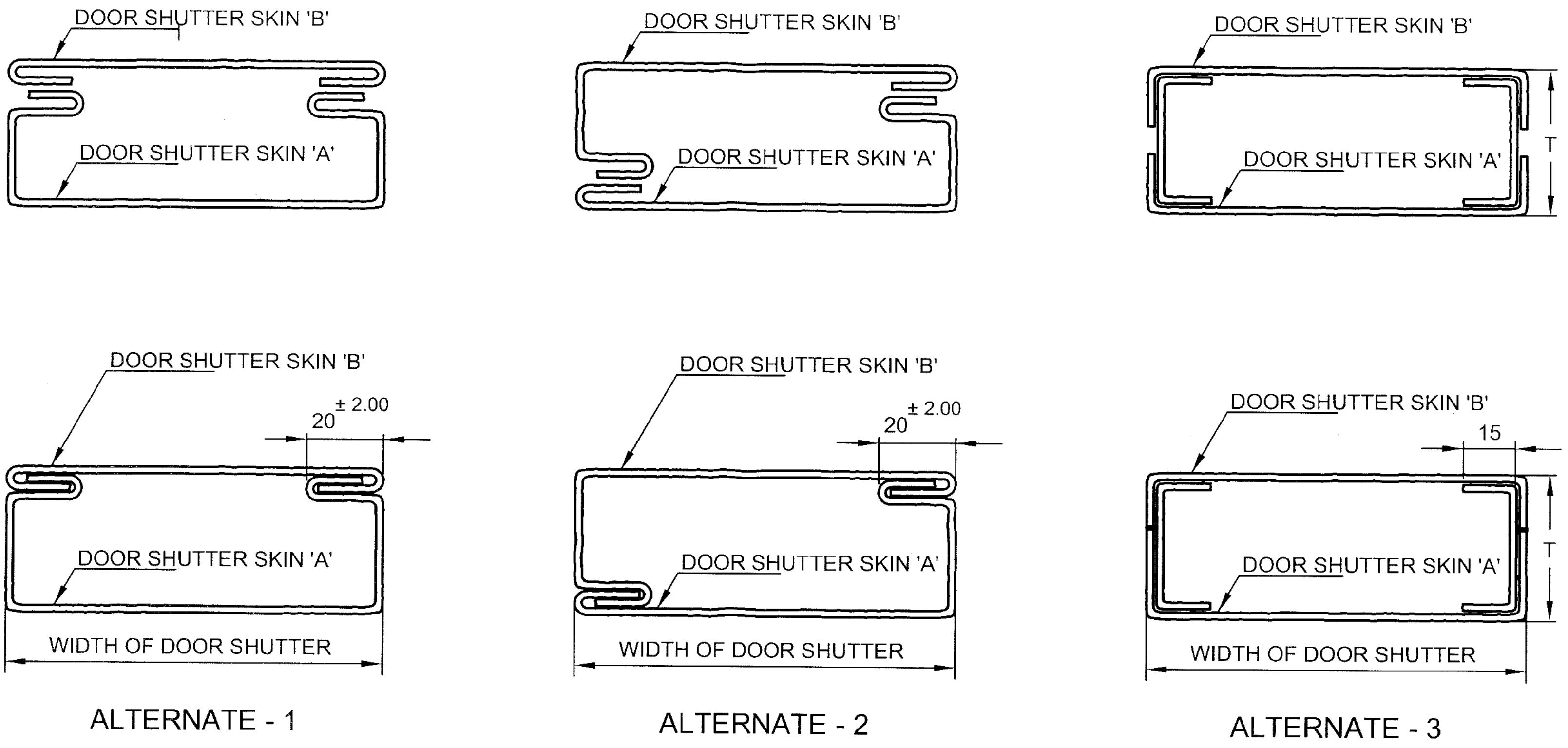

5mm Clearance
Thickness of Door Frame
Minus Rebate = 45mm
45mm
5mm
M_H = Modular Height of Door Opening
M_H - 10mm =Overall Height of Door Frame
M_H - 95mm = Height of Shutter
Finished Floor
Level
5mm Clearance
40mm
Structural Floor
Level
M_W - 100mm = Width of Shutter
M_W - 10mm = Overall Width of Door Frame
M_W = Modular Width of Door Opening

FIG. 1 SKETCH ILLUSTRATING DIMENSIONS OF SHUTTER



ALTERNATE - 1

ALTERNATE - 2

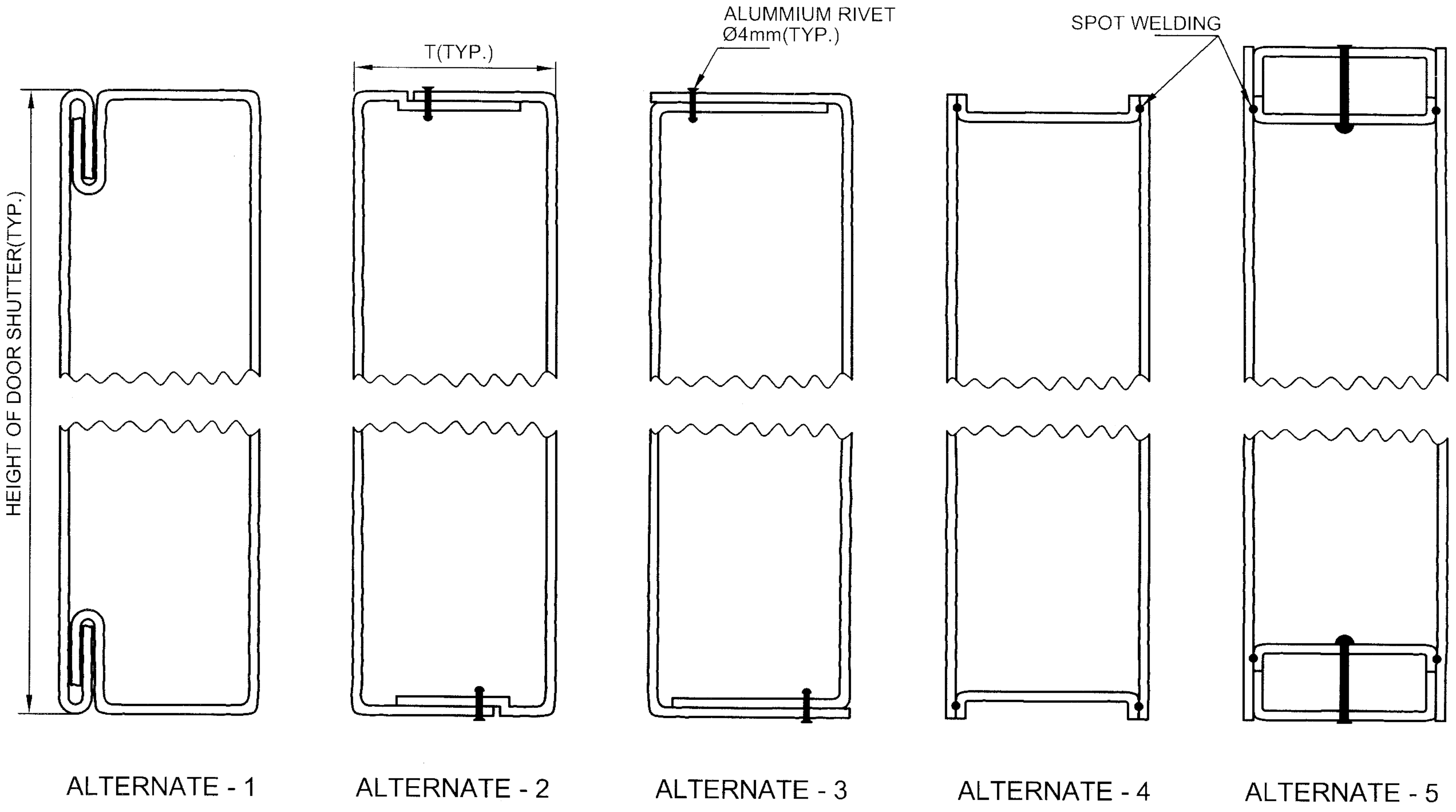
ALTERNATE - 3

NOTES

1 All dimensions in millimetres.

2 T - Thickness of Shutter

FIG. 2 DIFFERENT TYPES OF JOINTS AT VERTICAL EDGE OF STEEL FLUSH DOOR SHUTTER

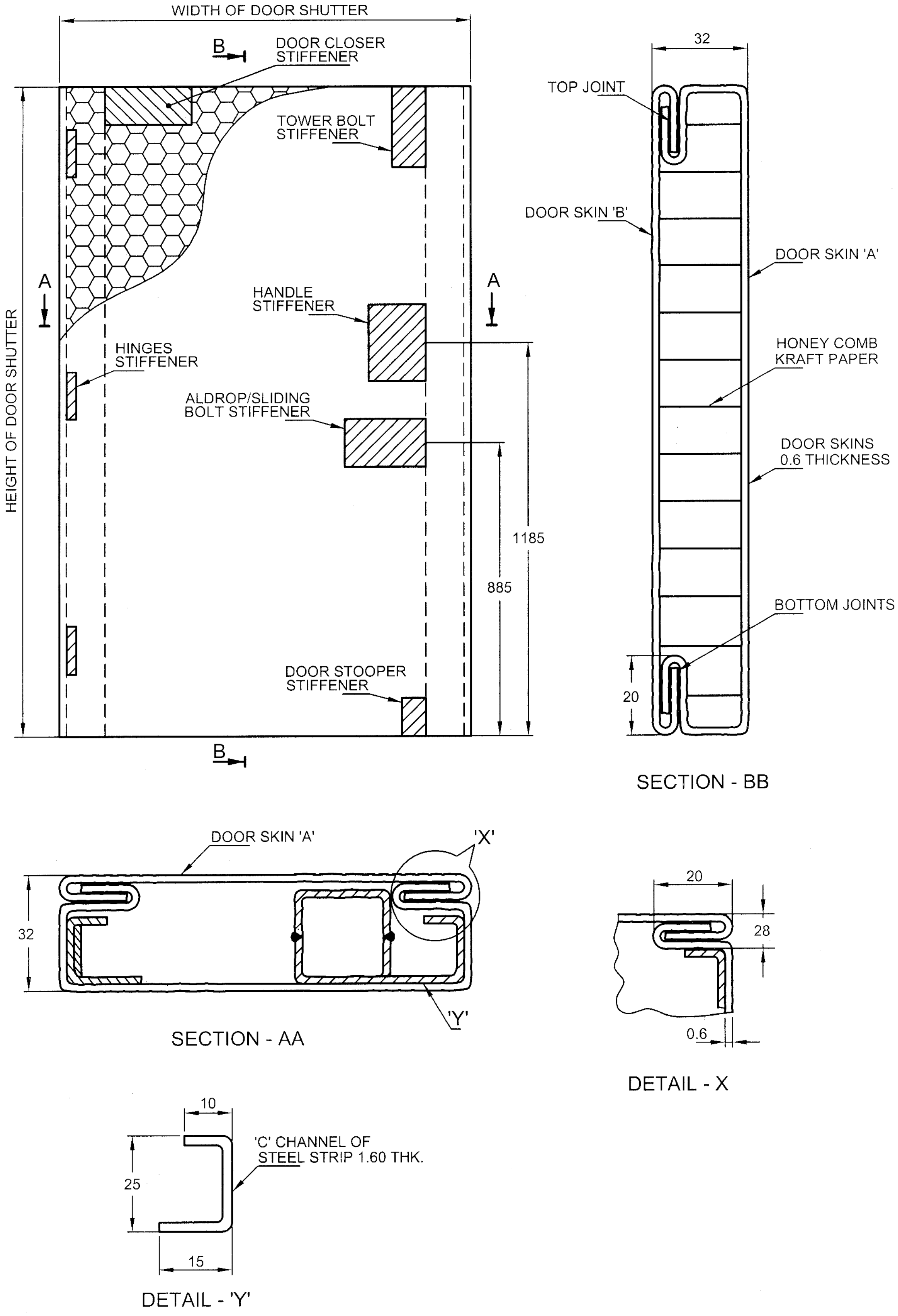


NOTES

1 All dimensions in millimetres.

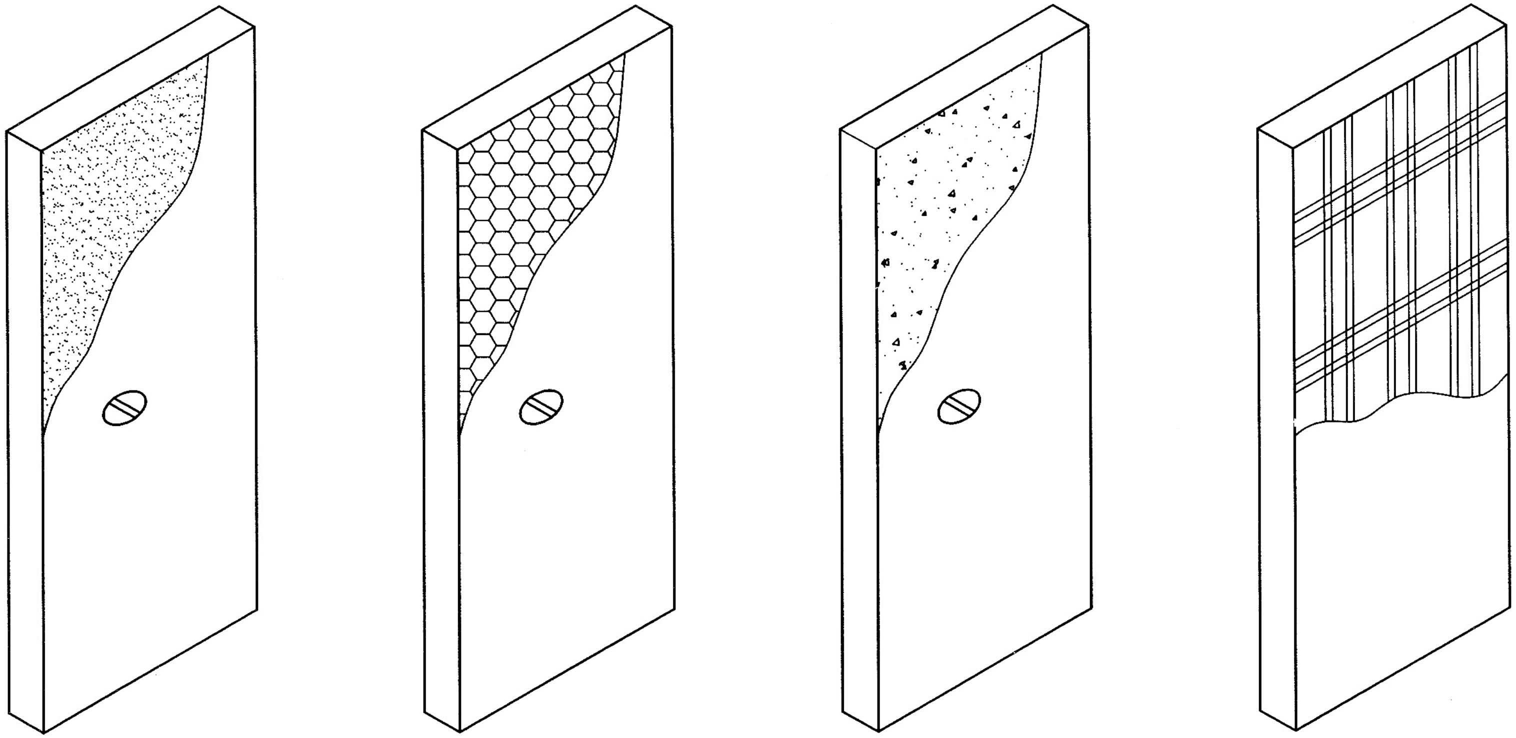
2 T-Thickness of Shutter

FIG. 3 DIFFERENT TYPES OF JOINTS AT TOP AND BOTTOM OF STEEL FLUSH DOOR SHUTTER



All dimensions in millimetres.

FIG. 4 TYPICAL ILLUSTRATION OF STEEL FLUSH DOOR SHUTTER AND ITS COMPONENTS



RIGID POLYURETHANE
FOAM (PUF) CORE

ALTERNATE - 1

HONEY COMB
KRAFT PAPER CORE

ALTERNATE - 2

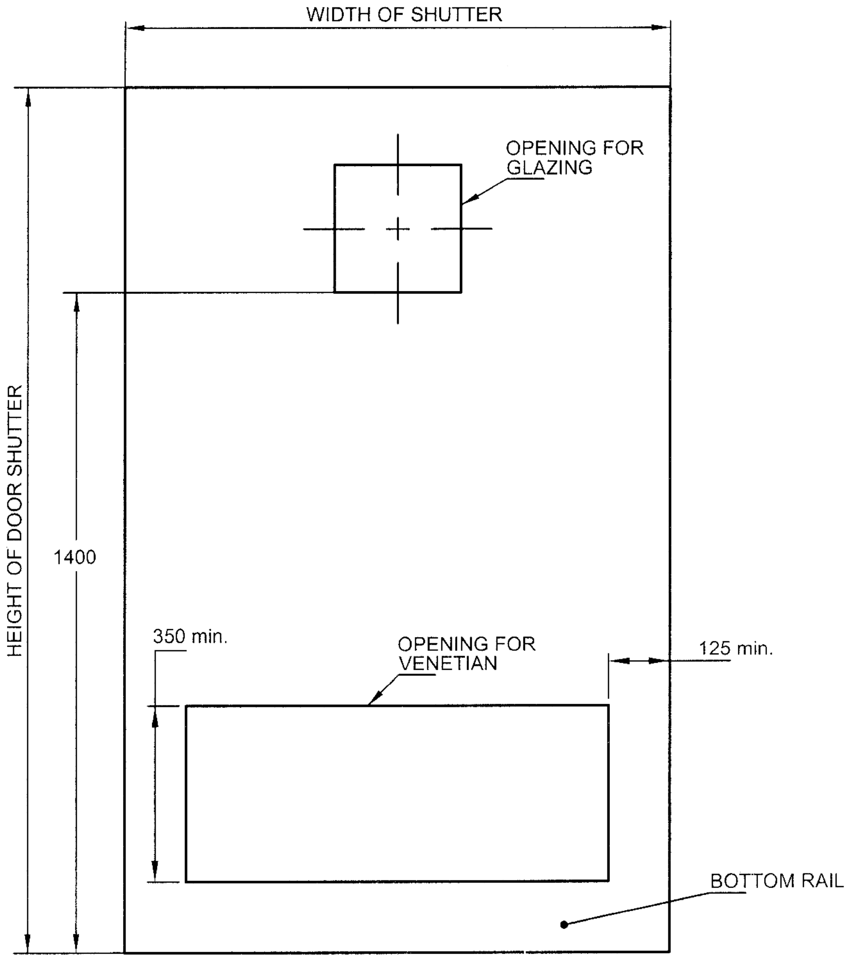
MINERAL WOOL/ROCK
WOOL/POLYSTYRENE CORE

ALTERNATE - 3

HOLLOW STEEL
STIFFENED CORE

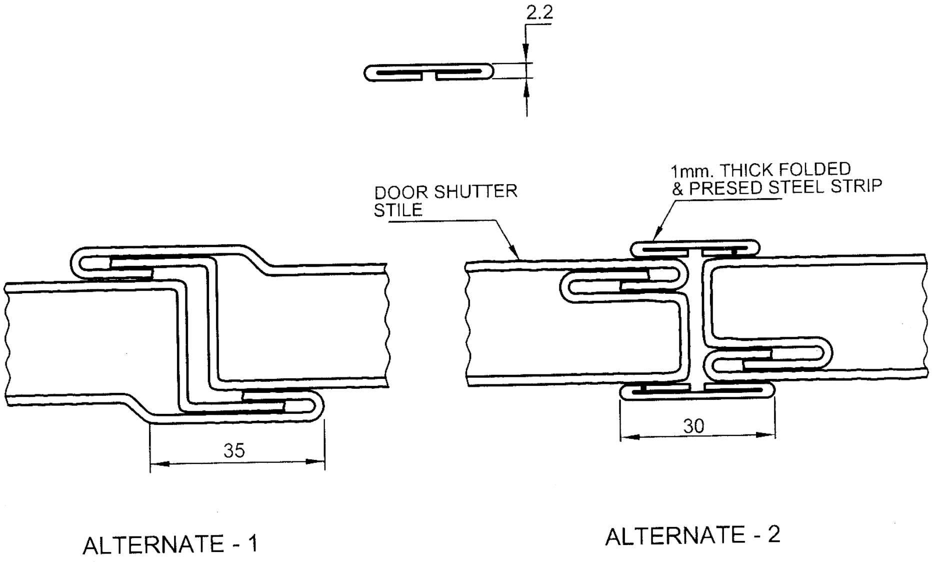
ALTERNATE - 4

FIG. 5 DIFFERENT TYPES OF INFILL/CORE MATERIAL FOR STEEL FLUSH DOOR SHUTTER



All dimensions in millimetres.

FIG. 6 TYPICAL LOCATION OF OPENING FOR GLAZING AND VENETIAN



All dimensions in millimetres.

FIG. 7 MEETING OF STILES FOR DOUBLE LEAVED DOOR SHUTTER

8.6 Workmanship

All the four edges of the door shutter shall be square, free from twist, rounded at the corners and free from burrs.

9 LOCATION OF FITTINGS AND ACCESSORIES

9.1 Hinges

The type, size and number of hinges to be provided to the door shutter shall be as per **10.2.1**, **10.2.2**, **10.2.3** and Table 3 of IS 4351. Stiffeners of steel strips of thickness 3.0 mm shall be welded to the pressed angle from the inner side of the shutter. The combined pressed angle (of 1.60 mm thick) and steel strip (of 3 mm thick) shall be threaded to the required size of machine screw (M5 × 20 CSK) conforming to IS 1365.

9.2 Aldrop, Sliding Bolt, Tower Bolt, Door Stopper and Door Closer

Stiffeners of pressed 'C' channels and plain steel strips of sheet thickness 1.60 mm and of sufficient width and length shall be provided inside the shutter at suitable places to fix fittings and fixtures, such as, aldrop, tower bolt, sliding bolt, door stopper, door closer, etc (*see* Fig. 4).

9.3 Mortize Lock and Latch

Provision shall be made to fix mortize lock or latch. The slots and holes shall be pierced in to the door shutter and necessary fixing arrangement shall be provided.

10 FINISH

10.1 Pre-treatment and Phosphating

10.1.1 *Door Shutters of Mild Steel Sheet*

The surface of the door shutters manufactured from cold rolled mild steel sheet shall be thoroughly cleaned so as to be free from rust, dirt and oil, etc, by chemical means like pickling and phosphating in accordance with IS 1477 (Part 1). The shutters shall then be finished with either painting or powder coating, as agreed to between the purchaser and the manufacturer.

10.1.2 *Door Shutters of Galvanized Plain Steel Sheets*

The surface of the door shutters manufactured from galvanized plain steel sheet shall be pre-treated and phosphated by chemical means conforming to IS 1477 (Part 1). No pickling is required for galvanized surface. The shutters shall be finished with either painting or powder coating, as may be agreed to between the purchaser and the manufacturer.

10.1.3 *Stainless Steel Door Shutters*

The surface of the stainless steel shutters shall be pre-treated as per the procedure laid down in IS 1477 (Part 1) in which pickling shall be carried out by using mixed acid of nitric plus hydrofluoric acid and the surface passivated by using nitric acid followed by rinsing with water and drying. Unless otherwise specified by the purchaser, stainless steel door shutters need not be painted or powder coated.

10.2 Painting

When the door shutter is to be painted, two coats of paint shall be applied after pre-treatment and phosphating, by brushing or spraying in accordance with the method laid down in IS 1477 (Part 2). The type of paint used shall be as specified in IS 1477 (Part 2) or be of any other type as agreed to between the manufacturer and the purchaser. The colour shall be as agreed to between the manufacturer and the purchaser.

10.3 Powder Coatings

Where the door shutter is to be finished by powder coating, the surface of the shutter shall be provided with powder coating conforming to IS 13871 after pre-treatment and phosphating. The colour of the coating shall be as agreed to between the purchaser and the manufacturer.

11 TESTS

The following tests shall be conducted on the door shutter in accordance with IS 4020 (Parts 1 to 16):

a) Dimensions and squareness test,
b) General flatness test,
c) Local planeness test,
d) Impact indentation test,
e) Flexure test,
f) Edge loading test,
g) Shock resistance test,
h) Buckling resistance test,
j) Slamming test, and
k) Misuse test.

12 REQUIREMENTS

12.1 Dimensions and Squareness Test

When tested in accordance with IS 4020 (Part 2), the nominal width and height of the door shutters shall be within the limit specified in **7.3**. The door shutter shall not deviate by more than 1 mm on a length of 500 mm. The thickness of the door shutter shall be uniform throughout with the permissible variation of not more than 0.8 mm between any two points. The nominal thickness of the shutter shall be within the limit specified in **7.3**.

12.2 General Flatness Test

When tested in accordance with IS 4020 (Part 3), the twist, cupping and warping in door shutter shall not exceed 5 mm.

12.3 Local Planeness Test

When tested in accordance with IS 4020 (Part 4), the depth of deviation measured at any point of the door shutter shall not be more than 0.5 mm.

12.4 Impact Indentation Test

When tested in accordance with IS 4020 (Part 5), the door shutter shall have no defect, such as, cracking, tearing or delamination and the depth of indentation shall not be more than 0.2 mm for 'light duty' shutters and not more than 0.1 mm for 'heavy duty' shutters.

12.5 Flexure Test

When tested in accordance with IS 4020 (Part 6), there shall not be any residual deflection in the door shutter of more than one tenth of the maximum deflection. The deflection at the maximum load shall not be more than one fifteenth of the length and one twentieth of the width, whichever is less.

12.6 Edge Loading Test

When tested in accordance with IS 4020 (Part 7), the deflection of the edge of the door shutter at the maximum load shall not be more than 5 mm. On removal of the load, the residual deflection shall not be more than 0.5 mm, failing which the test may be repeated on the other edge in the reverse direction. There shall be no lateral buckling by more than 2 mm during loaded condition and no residual lateral buckling of more than 1 mm after removal of the load.

12.7 Shock Resistance Test

12.7.1 When tested in accordance with **2.1** of IS 4020 (Part 8), there shall be no visible damage in any part of the door shutter after twenty five blows on each end.

12.7.2 When tested in accordance with **3.1** of IS 4020 (Part 8), the normally hung door shutter with hangings, fixing and fastenings should withstand without any significant permanent deformation and without deterioration five impacts on both sides of the shutter.

12.8 Buckling Resistance Test

When tested in accordance with IS 4020 (Part 9), the door shutter shall not show any deterioration and residual deformation of more than 5 mm after 15 min of unloading. The initial deflection, 5 min after application of load, shall be not more than 25 mm.

12.9 Slamming Test

12.9.1 Any one of the following tests given in **12.9.2** and **12.9.3** shall be used.

12.9.2 When tested in accordance with **2.1** of IS 4020 (Part 10), the door shutter shall not have any visible damage in any part of the door at the end of 50 successive impacts.

12.9.3 When tested in accordance with **3.1** of IS 4020 (Part 10), the door shutter shall not have any visible damage in any part of the door at the end of 100 successive impacts.

12.10 Misuse Test

When the door shutter is tested in accordance with IS 4020 (Part 11), there shall not be any deformation of the fixing or any other part of the door-set in hindering its normal working after the test.

13 SAMPLING AND CRITERIA FOR CONFORMITY

The sampling and criteria for conformity for steel door shutters shall be as given in Annex B.

14 MARKING

14.1 Each door shutter shall be legibly and indelibly marked on any of its edges with the following information:

a) Name of the manufacturer or trade-mark, if any;
b) Classification of the shutters;
c) Whether the size of the shutter is 'Modular' or 'Non-modular';
d) Designation as specified in Table 2 for modular sizes, or the actual size (width and height) for non-modular sizes;
e) Thickness of door shutters (*see* **7.2**); and
f) Batch number/date of manufacture for identification.

14.2 BIS Certification Marking

The shutter may also be marked with the Standard Mark.

14.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standard Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

15 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser shall supply the following information at the time of placing the order:

a) The classification, size and the type of steel door shutters, the handing of door (right or left) and the way the door is required to open (inward or outward);

b) Whether single or double leaved;

c) Details of hardware fittings and accessories like hinges, aldrops, sliding bolts, tower bolts, mortize locks, latches, door closer and handles, etc, and samples of the same have to be supplied by the purchaser to provide necessary fixing arrangement; and

d) Whether the door shutters are to be of primer or synthetic enamel finish or of powder coated finish.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
277 : 2003	Galvanized steel sheets (Plain and corrugated) — Specification (*sixth revision*)
513 : 2008	Cold reduced low carbon steel sheet and strip — Specification (*fifth revision*)
1365 : 2005	Slotted countersunk flat head screws (Common head style) — Product Grade A (*fourth revision*)
1477	Code of practice for painting of ferrous metals in buildings:
(Part 1) : 1971	Pre-treatment (*first revision*)
(Part 2) : 1971	Painting (*first revision*)
4020 (Parts 1 to 16) : 1998	Door shutters — Methods of tests (*third revision*)
4021 : 1995	Timber door, window and ventilator frames — Specification (*third revision*)
4043 : 1969	Recommendations for symbolic designation of direction of closing and faces of doors, windows and shutters
4351 : 2003	Steel door frames — Specification (*second revision*)
6911 : 1992	Stainless steel plate, sheet and strip — Specification (*first revision*)
10428 : 1983	Glossary of terms relating to doors
13871 : 1993	Powder coatings — Specification
14246 : 1995	Continuously pre-painted galvanized steel sheets and coils — Specification

ANNEX B

(*Clause* 13)

SAMPLING AND CRITERIA FOR CONFORMITY

B-1 LOT

In any consignment, all the shutters of the same class and construction, and manufactured under similar conditions of production shall be grouped together to constitute a lot.

B-2 SAMPLE SIZE

B-2.1 The number of specimens to be taken for testing of shutters for dimensions and squareness, general flatness and local planeness shall be in accordance with col 2 and 3 of Table 4.

B-2.2 For slamming test the number of shutters to be taken for testing shall be as per col 5 of Table 4.

B-2.3 For impact indentation test one shutter shall be tested on production of 1 000 shutters of the same size and type.

B-2.4 For flexure, edge loading, shock resistance, misuse and buckling resistance tests the shutters shall be tested once a year and whenever the design and construction is changed.

B-2.5 Criteria for Conformity

The lot shall be declared as conforming to the requirements of the standard when the number of defective samples does not exceed the permissible number given in col 4 of Table 4.

Table 4 Sample Size and Criteria for Conformity

(*Clauses* B-2.1, B-2.2 *and* B-2.5)

Sl No. (1)	**Lot Size** (2)	**Sample Size** (3)	**Permissible No. of Defectives** (4)	**Sub-Sample Size** (5)
i)	1 to 50	5	0	1
ii)	51 - 100	8	0	2
iii)	101 - 150	13	1	2
iv)	151 - 300	20	2	3
v)	301 - 500	32	3	4
vi)	501 and above	50	5	5

NOTE — For lot size 25 or less, number of samples to be taken for testing shall be as agreed to between the manufacturer and the purchaser.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Doors Windows and Shutters Sectional Committee, CED 11

Organization	*Representative(s)*
In personal capacity, (*104, Ankur Apartments, IP Extension, Delhi*)	Shri T. K. Sinha (***Chairman***)
A. P. Road and Buildings, Hyderabad	Chief Engineer (R&B) Buildings
Anand Industries Limited, New Delhi	Shri H. S. Anand Shri P. N. Anand (*Alternate*)
B. G. Shirke Construction Technology Ltd, Pune	Shri S. K. Wagh Shri Y. B. Pathan (*Alternate*)
Builders Association of India, Chennai	Shri M. S. K. Vasudeva Rao Shri M. Sathyanarayanamurthy (*Alternate*)
Building Material & Technology Promotion Council, New Delhi	Shri J. K. Prasad Shri Pankaj Gupta (*Alternate*)
Central Building Research Institute, Roorkee	Dr B. Singh Shri S. K. Saini (*Alternate*)
Central Public Works Department, New Delhi	Shri R. K. Kakar Shri Sanjib Sengupta (*Alternate*)
Central Institute for Plastics & Engineering Technology, Chennai	Dr S. N. Yadav Dr R. K. Singh (*Alternate*)
Directorate General of Supplies & Disposals, New Delhi	Shri A. Tirkey Shri S. K. Agarwal (*Alternate*)
Engineer-in-Chief's Branch, New Delhi	Shri A. U. Khan Shri K. K. Yadav (*Alternate*)
Engineers India Ltd, New Delhi	Shri J. K. Bhagchandani Shri Snigdho Majumdar (*Alternate*)
Forest Research Institute, Dehra Dun	Shri Vimal Kothiyal Shri D. P. Khali (*Alternate*)
Housing & Urban Development Corporation Ltd, New Delhi	Shri Ram Vir Singh Shri Rajeev Garg (*Alternate*)
Indian Building Congress, New Delhi	Shri A. K. Srivastava
Indian Plywood Industries Research & Training Institute, Bangalore	Shri Anand Nandanwar Shri Jagadeesh Vengala (*Alternate*)
Kutty Flush Door & Furniture Co Pvt Ltd, Chennai	Shri K. Sankarkrishnan Col Y. G. Krishnan (*Alternate*)
Mangalam Timber Products Ltd, Kolkata	Shri R. C. Singh Shri S. K. Chand (*Alternate*)
Ministry of Micro, Small & Medium Enterprises, New Delhi	Shri G. Rajamonickam Shri K. K. Funda (*Alternate*)
Multiwyn Industrial Corporation, Kolkata	Shri B. K. Jhajharia Shri Vishal Jhajaharia (*Alternate*)
National Test House, Kolkata	Shri D. V. S. Prasad Shri Aloke De (*Alternate*)
National Mission on Bamboo Application, New Delhi	Shri N. Krishna Kumar
Nuchem Limited, New Delhi	Shri Sudev Barar Shri Arush Barar (*Alternate*)
Public Works Department Haryana, Chandigarh	Shri R. K. Gandhi
Rajasthan Housing Board, Jaipur	Shri B. N. Moolchandani Shri D. C. Babel (*Alternate*)

Organization	*Representative(s)*
Sintex Industries Ltd, Kalol	Shri S. Venkat Ram Shri Rajan Gulabani (*Alternate*)
BIS Directorate General	Shri A. K. Saini, Scientist ‘F’ and Head (Civ Engg.) [Representing Director General (*Ex-Officio*)]

Member Secretary
Shri J. Roy Chowdhury
Scientist ‘E’ (Civ Engg), BIS

Metal Doors, Windows and Shutters Subcommittee, CED11:2

Organization	*Representative(s)*
Central Public Works Department, New Delhi	Suptg Engineer (S&S) (***Convener***) Executive Engineer (S&S) (*Alternate*)
Agew Steel Manufacturers Pvt Ltd, Ahmedabad	Shri Pallavbhai B. Shah Shri Vibubhai M. Shah (*Alternate*)
Anand Industries Limited, New Delhi	Shri H. S. Anand
B. G. Shirke Construction Technology Ltd, Pune	Shri S. K. Wagh Shri Y. B. Pathan (*Alternate*)
Builders Association of India, Chennai	Shri M. S. K. Vasudeva Rao
Building Material & Technology Promotion Council, New Delhi	Shri C. N. Jha Dr Amit Rai (*Alternate*)
Central Building Research Institute, Roorkee	Shri R. K. Garg Shri D. K. Gautam (A*lternate*)
Delhi Development Authority, New Delhi	Shri A. K. Nigah Dr K. S. Dabas (*Alternate*)
Engineer-in-Chief’s Branch, New Delhi	Shri K. C. Nagpal Srimati Anjali Doda (*Alternate*)
Hindalco Industries Ltd, Mumbai	Shri K. Sadashiva Bhat Shri A. Jayagopal (*Alternate*)
Indian Building Congress, New Delhi	Shri A. K. Srivastava
J H Aluminium Pvt Ltd, Chennai	Shri J. Raghuram Shri J. Jayprakash (*Alternate*)
Maganti Brothers, Chennai	Shri M. S. K. Vasudeva Rao Shri M. Sathyanarayanamurthy (*Alternate*)
Maharashtra Housing & Area Development Authority, Mumbai	Chief Engineer (Planning & Development) Dy Chief Engineer (Planning & Development) (*Alternate*)
Ministry of Railways, RDSO, Lucknow	Director (Standards) Dy Director (Standards) (*Alternate*)
Modern Fabricators, Kolkata	Shri Manik Sarkar Shri S. K. Sarkar (*Alternate*)
Multiwyn Industrial Corporation, Kolkata	Shri B. K. Jhajharia Shri Vishal Jhajaharia (*Alternate*)
National Test House, Kolkata	Shri V. D. Meharkure Shrimati S. A. Kaushil (*Alternate*)
Public Works Department, New Delhi	Shri Vinay Kumar
School of Planning and Architecture, New Delhi	Representative
Sen Harvik Windows Pvt Ltd, Surat	Shri Ravindra N. Shah Shri Surajmal T. Solanki (*Alternate*)

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: CED 11 (7663).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

Regional Offices:		*Telephones*
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	260 3843 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	2832 9295, 2832 7858 2832 7891, 2832 7892

Branches: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Published by BIS, New Delhi